FAA
Office of Commercial
Space Transportation

Quarterly Launch Report
2nd Quarter 2005

Featuring the launch results from the 1st quarter 2005
and forecasts for the 2nd and 3rd quarters of 2005

Quarterly Report Topic: Non-Federal U.S. Spaceport
Infrastructure and Investment

Introduction

The Second Quarter 2005 Quarterly Launch Report *features launch results from the first quarter of 2005 (January-March 2005) and forecasts for the second quarter of 2005 (April-June 2005) and third quarter of 2005 (July-September 2005). This report contains information on worldwide commercial, civil, and military orbital and commercial suborbital space launch events. Projected launches have been identified from open sources, including industry references, company manifests, periodicals, and government sources. Projected launches are subject to change.*

This report highlights commercial launch activities classifying commercial launches as one or both of the following:

- *Internationally-competed launch events (i.e., launch opportunities considered available in principle to competitors in the international launch services market)*
- *Any launches licensed by the Office of Commercial Space Transportation of the Federal Aviation Administration under 49 United States Code Subtitle IX, Chapter 701 (formerly the* Commercial Space Launch Act*)*

Contents

Cover (Atlas 5 photo copyright © 2005, courtesy of International Launch Services and Lockheed Martin; Zenit 3SL photo copyright © 2005, courtesy of Sea Launch): On left, an Atlas 5, marketed by International Launch Services, sends Inmarsat 4-F1, operated by Inmarsat, on its way to geosynchronous orbit on March 11, 2005 from Cape Canaveral Air Force Station. On right, a Zenit 3SL, marketed by Sea Launch, sends XM 3, operated by XM Satellite Radio, on its way to geosynchronous orbit on February 28, 2005 from the Odyssey Launch Platform in the Pacific Ocean.

First Quarter 2005 Highlights

In January, Blue Origin, the commercial space transportation company founded by Jeff Bezos, unveiled plans to establish a rocket test range and test site near Van Horn in West Texas for its planned three-person suborbital tourism vehicle.

On January 19, the European Space Agency (ESA) and the Russian Federal Space Agency (Roscosmos) signed an agreement for long-term cooperation "in the development, implementation and use of launchers." One aspect of this partnership will be the already-agreed use of Russian Soyuz boosters from a new launch pad under construction at Kourou, the first launch from which is expected in 2007. Additionally, ESA and Roscosmos have agreed in principle to the joint development of future launch vehicles featuring reusable engines and stages by 2020.

South Korea's Korean Aerospace Research Institute (KARI) announced its intention to build and test 10 launch vehicles derived from Russian Angara boosters. The first of these vehicles will be the KSLV 1, which KARI plans to test launch in 2007.

On February 3, the final launch of the Atlas 3 series took place from Cape Canaveral Air Force Station, successfully lofting the National Reconnaissance Office (NRO) payload NOSS F3 into low Earth orbit.

On February 26, Japan's Rocket Systems Corporation launched MTSat 1R, marking a successful return to flight for the H 2A launch vehicle. The H 2A had not flown since November 2003, when one of its two solid rocket boosters failed to separate properly, resulting in a launch failure.

In a merger marking further consolidation in the U.S. launch vehicle industry, Boeing announced plans to sell its Rocketdyne Division to Pratt & Whitney, owned by United Technologies, for approximately $700 million.

Gregg Maryniak of the X Prize Foundation announced that leaders from the emerging suborbital tourism market, or "personal spaceflight industry," are organizing an industry federation to formulate and uphold the standards and processes necessary to ensure public safety and promote the industry. The group will be called the Voluntary Personal Spaceflight Industry Consensus Organization, and will seek to implement the Commercial Space Launch Amendments Act of 2004. Participants thus far include John Carmack of Armadillo Aerospace; Burt Rutan of Scaled Composites; Elon Musk of SpaceX; Alex Tai of Virgin Galactic; Jeff Greason of XCOR; Dr. Peter Diamandis of the X Prize Foundation; Gary Hudson of t/Space/HMX; George French of Pioneer Rocketplane; Stuart Witt of Mojave Spaceport; Eric Anderson of Space Adventures; and Michael S. Kelly, Chairman of the RLV Working Group of COMSTAC. The federation will be facilitated by X Prize Foundation executives Mr. Maryniak and Diane Murphy.

On March 4, the U.S. Air Force announced that it was lifting the 20-month contracting suspension it had placed on Boeing in 2003 following disclosure of the company's ethical breaches in competing with Lockheed Martin for government launch contracts. Having agreed to reimburse the government $1.9 million for investigation costs, and to allow ongoing external verification of its ethical compliance, Boeing is now eligible to compete for the next round of Evolved Expendable Launch Vehicle (EELV) contracts, expected to be announced in late 2005 or early 2006.

In March, the Aera Corporation announced its intention to launch its Altairis suborbital space tourism vehicle from Cape Canaveral, with plans to offer commercial flights as early as the fall of 2006. Altairis, a liquid-fueled, reusable vehicle, would carry six passengers and one crewperson. It would take off vertically and soar to an altitude of 120 kilometers (75 miles) in an automatically controlled flight. The crew capsule would separate from the rocket and coast to apogee before falling back to earth, using a parafoil and inflatable airbags to land safely.

On March 16, Greece formally became the 16th member state of ESA.

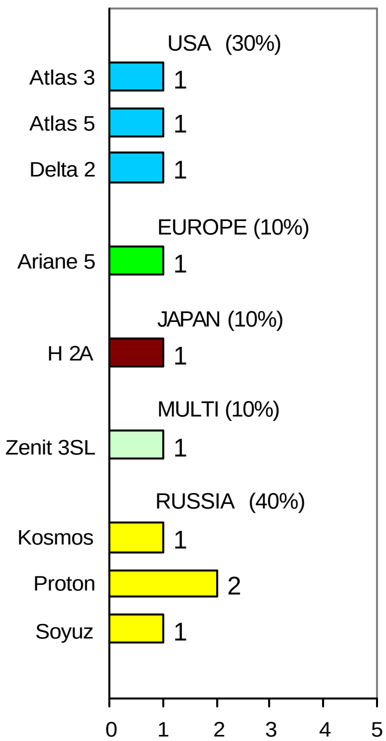
The French Space Agency (CNES) and Roscosmos have agreed to collaborate on the design of future launchers. As part of this five-year program, named Oural, France will provide 200 million euros in funding for new technologies, including experimental liquid oxygen-methane engines, new cryogenic tank materials, and a demonstrator re-entry gliding vehicle, called Pre-X.

Michael Griffin, head of the space department of the Applied Physics Laboratory at Johns Hopkins University, was nominated as the new NASA Administrator. Meanwhile, NASA announced plans to cut its workforce by 15% by mid-2006 in a move to further streamline the agency.

Vehicle Use

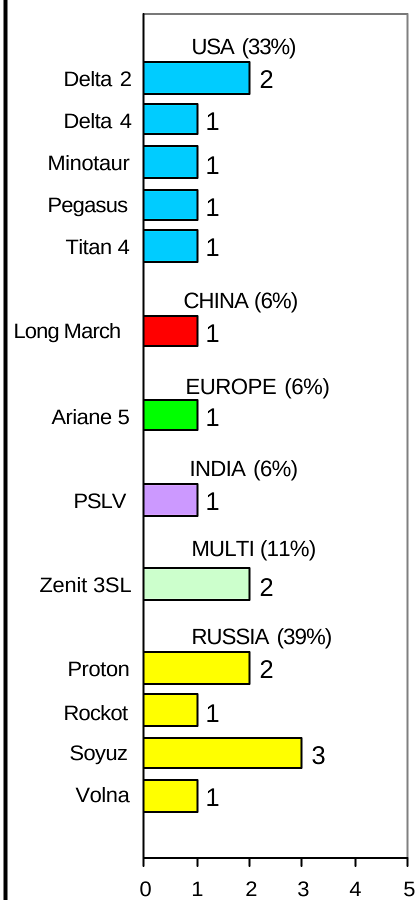
(January 2005 – September 2005)

Figure 1: First Quarter 2005 Total Launch Vehicle Use



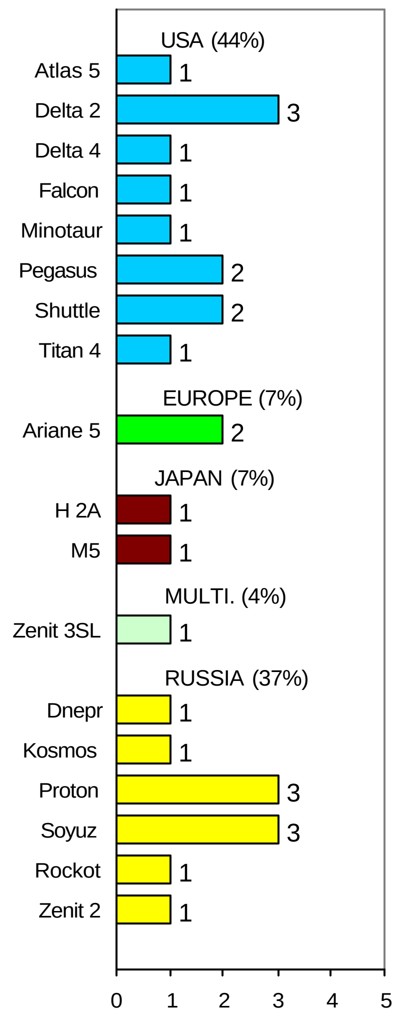
Total = 10

Figure 2: Second Quarter 2005 Total Projected Launch Vehicle Use



Total = 18

Figure 3: Third Quarter 2005 Total Projected Launch Vehicle Use



Total = 27

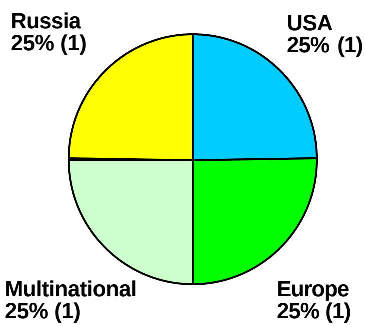
Figures 1-3 show the total number of orbital and suborbital launches (commercial and government) of each launch vehicle and the resulting market share that occurred in the first quarter of 2005, as well as projecting this information for the second quarter of 2005 and third quarter of 2005. The launches are grouped by the country in which the primary vehicle manufacturer is based. Exceptions to this grouping are launches performed by Sea Launch, which are designated as multinational.

Note: Percentages for these and subsequent figures may not add up to 100 percent due to rounding of individual values.

Commercial Launch Events by Country

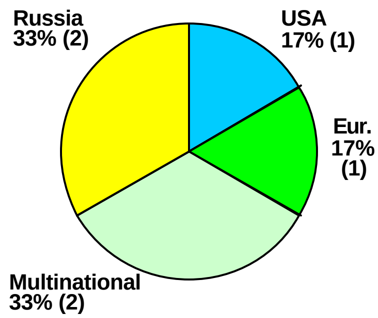
(January 2005 – September 2005)

Figure 4: First Quarter 2005 Commercial Launch Events by Country



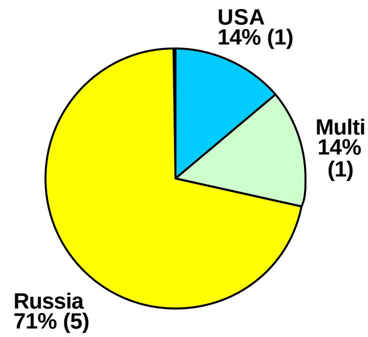
Total = 4

Figure 5: Second Quarter 2005 Projected Commercial Launch Events by Country



Total = 6

Figure 6: Third Quarter 2005 Projected Commercial Launch Events by Country



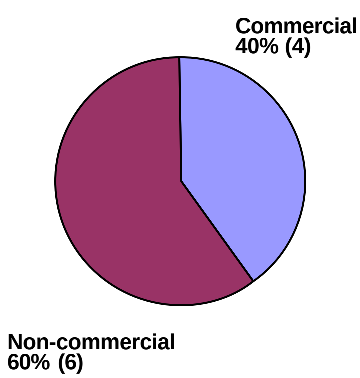
Total = 7

Figures 4-6 show all *commercial* orbital and suborbital launch events that occurred in the first quarter of 2005 and that are projected for the second quarter of 2005 and third quarter of 2005.

Commercial vs. Non-commercial Launch Events

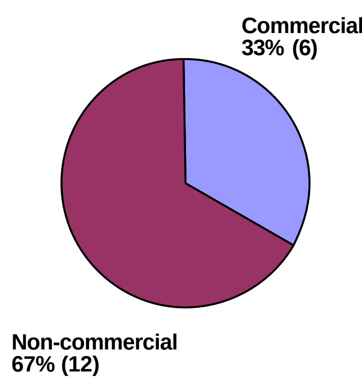
(January 2005 – September 2005)

Figure 7: First Quarter 2005 Commercial vs. Non-commercial Launch Events



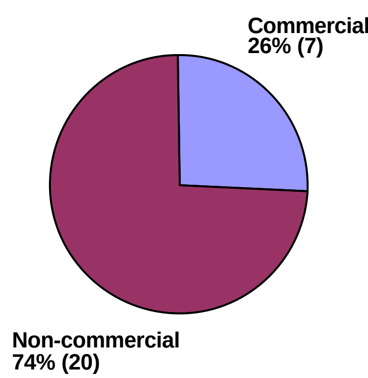
Total = 10

Figure 8: Second Quarter 2005 Projected Commercial vs. Non-commercial Launch Events



Total = 18

Figure 9: Third Quarter 2005 Projected Commercial vs. Non-commercial Launch Events



Total = 27

Figures 7-9 show commercial vs. non-commercial orbital and suborbital launch events that occurred in the first quarter of 2005 and that are projected for the second quarter of 2005 and third quarter of 2005.

Orbital vs. Suborbital Launch Events
(January 2005 – September 2005)

Figure 10: First Quarter 2005 Orbital vs. Suborbital Launch Events

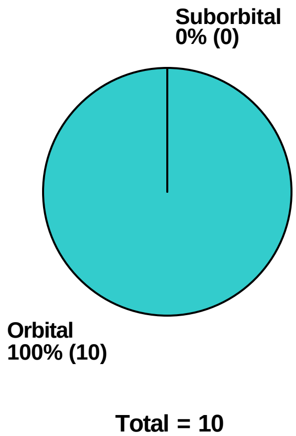


Figure 11: Second Quarter 2005 Projected Orbital vs. Suborbital Launch Events

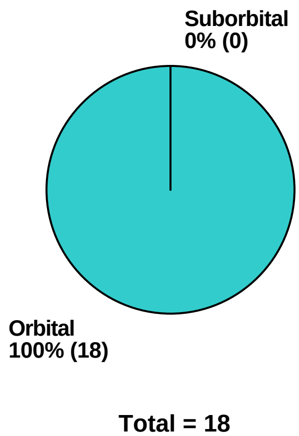
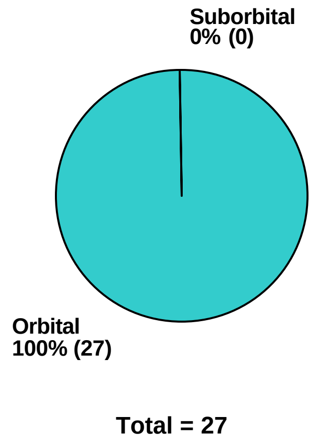


Figure 12: Third Quarter 2005 Projected Orbital vs. Suborbital Launch Events



Figures 10-12 show orbital vs. suborbital launch events that occurred in the first quarter of 2005 and that are projected for the second quarter of 2005 and third quarter of 2005.

Launch Successes vs. Failures
(January 2005 – March 2005)

Figure 13: First Quarter 2005 Launch Successes vs. Failures

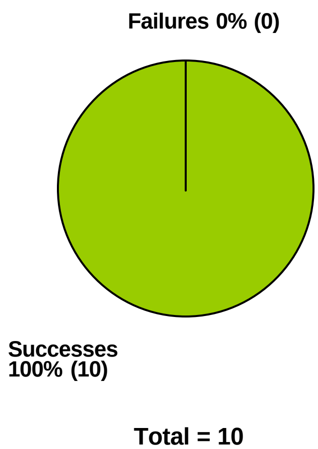
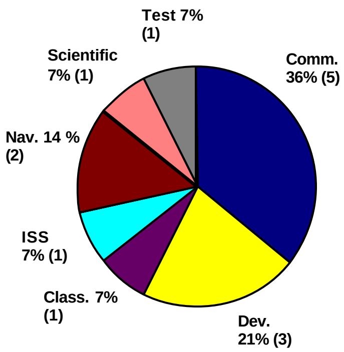


Figure 13 shows orbital and suborbital launch successes vs. failures for the period from January 2005 to March 2005. Partially-successful orbital launch events are those where the launch vehicle fails to deploy its payload to the appropriate orbit, but the payload is able to reach a useable orbit via its own propulsion systems. Cases in which the payload is unable to reach a useable orbit or would use all of its fuel to do so are considered failures.

Payload Use (Orbital Launches Only)

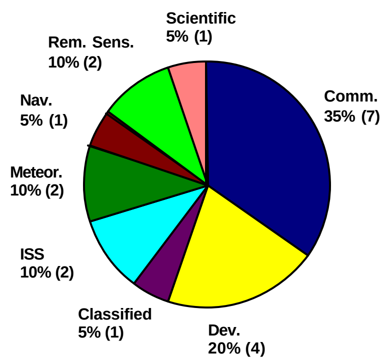
(January 2005 – September 2005)

Figure 14: First Quarter 2005 Payload Use



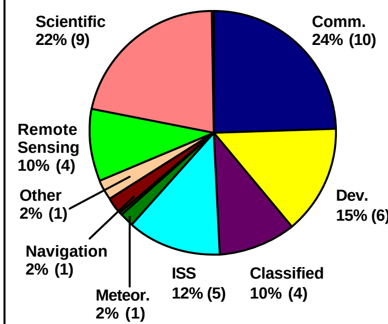
Total = 14

Figure 15: Second Quarter 2005 Projected Payload Use



Total = 20

Figure 16: Third Quarter 2005 Projected Payload Use



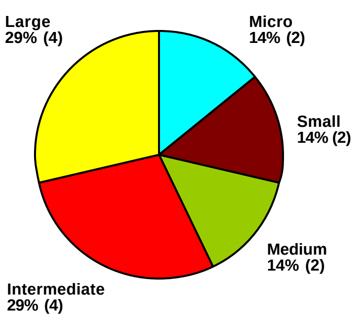
Total = 41

Figures 14-16 show total payload use (commercial and government), actual for the first quarter of 2005 and projected for the second quarter of 2005 and third quarter of 2005. The total number of payloads launched may not equal the total number of launches due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Payload Mass Class (Orbital Launches Only)

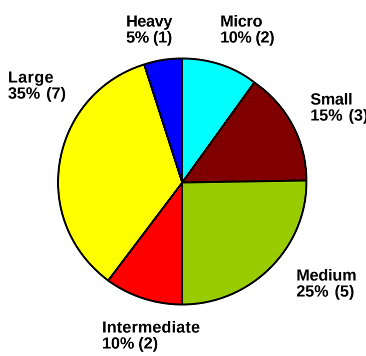
(January – September 2005)

Figure 17: First Quarter 2005 Payload Mass Class



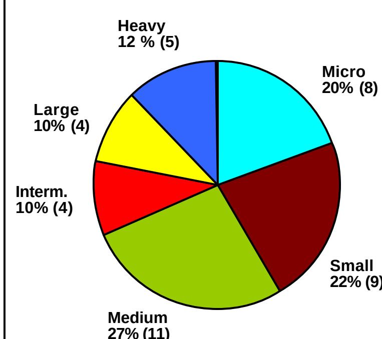
Total = 14

Figure 18: Second Quarter 2005 Projected Payload Mass Class



Total = 20

Figure 19: Third Quarter 2005 Projected Payload Mass Class

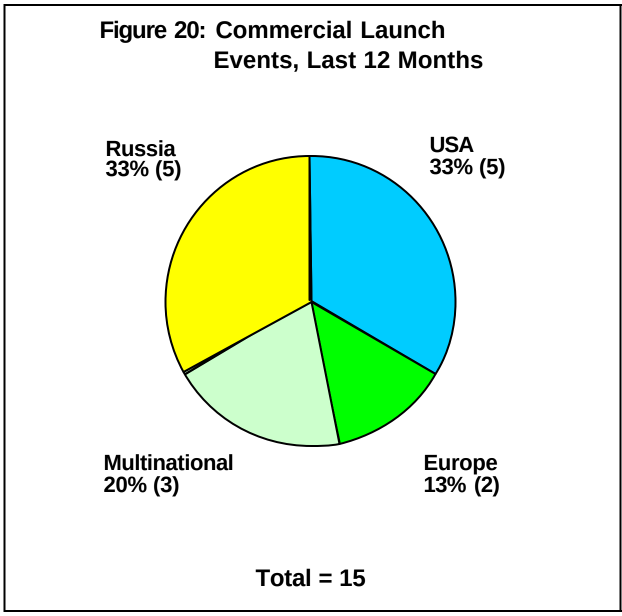


Total = 41

Figures 17-19 show total payloads by mass class (commercial and government), actual for the first quarter of 2005 and projected for the second quarter of 2005 and third quarter of 2005. The total number of payloads launched may not equal the total number of launches due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle. Payload mass classes are defined as Micro: 0 to 91 kilograms (0 to 200 lbs.); Small: 92 to 907 kilograms (201 to 2,000 lbs.); Medium: 908 to 2,268 kilograms (2,001 to 5,000 lbs.); Intermediate: 2,269 to 4,536 kilograms (5,001 to 10,000 lbs.); Large: 4,537 to 9,072 kilograms (10,001 to 20,000 lbs.); and Heavy: over 9,072 kilograms (20,000 lbs.).

Commercial Launch Trends (Orbital Launches Only)

(April 2004 – March 2005)



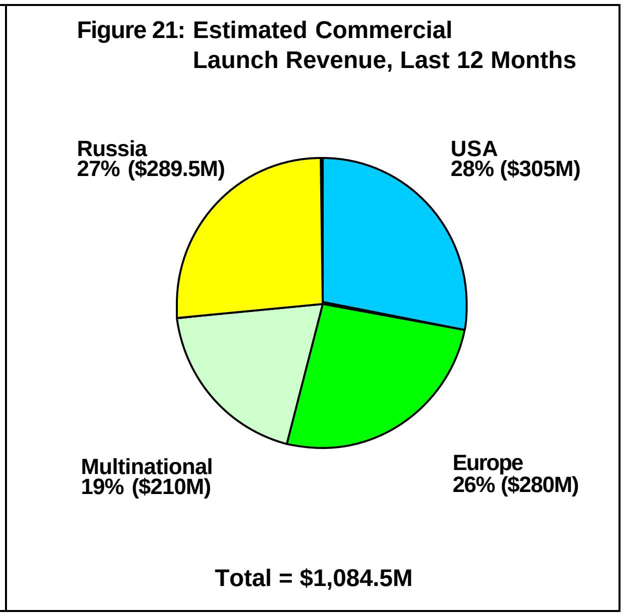


Figure 20 shows commercial orbital launch events for the period of April 2004 to March 2005 by country.

Figure 21 shows estimated commercial launch revenue for orbital launches for the period of April 2004 to March 2005 by country.

Commercial Launch Trends (Suborbital Launches Only)

(April 2004 – March 2005)

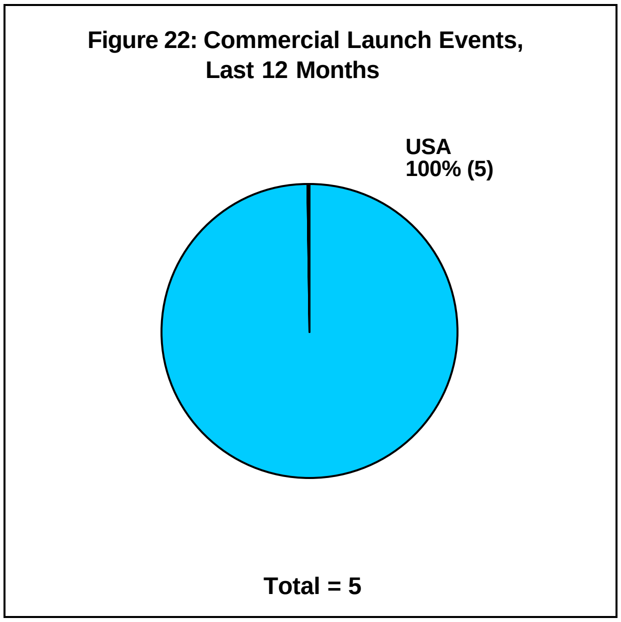


Figure 22 shows commercial suborbital launch events for the period of April 2004 to March 2005 by country.

Commercial Launch History

(January 2000 – December 2004)

Figure 23: Commercial Launch Events by Country, Last Five Years

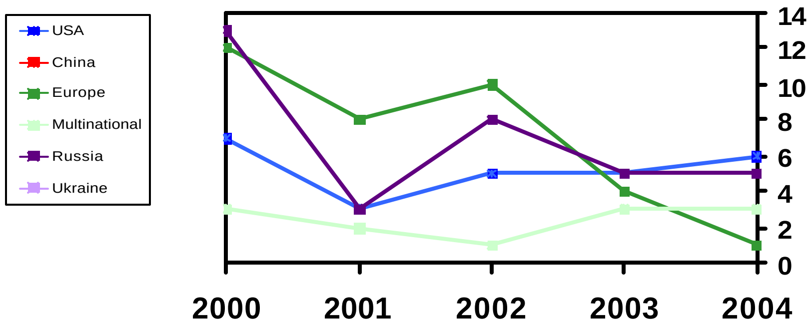


Figure 23 shows commercial launch events by country for the last five full years.

Figure 24: Estimated Commercial Launch Revenue (in $ million) by Country, Last Five Years

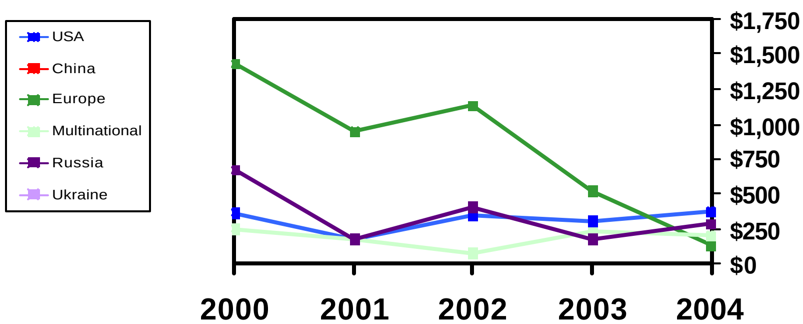


Figure 24 shows estimated commercial launch revenue by country for the last five full years.

Non-Federal U.S. Spaceport Infrastructure and Investment

Introduction

For more than 20 years, operators of commercial space launch vehicles have conducted activities primarily from federally operated launch ranges. In addition, the Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST) has licensed five sites across the country—most recently the inland site at Mojave Airport Civilian Flight Test Center, California—to conduct various launch activities. Most of those sites are located near or at federal ranges. Whether they are federal or non-federal sites, spaceports have brought industry and jobs to the regions where they are located, making them centers of economic activity.

The emergence of a market for suborbital passenger space flights and eventually orbital space travel has placed increasing emphasis on the need for additional launch sites in the U.S. to handle commercial launch activities. Commercial operators are seeking alternatives to federally operated launch sites. The landmark flights in 2004 of SpaceShipOne, the first private, manned suborbital rocket, placed Mojave Airport in the limelight. Although SpaceShipOne was launched in the air from the White Knight aircraft, the launch system's journey started and ended at Mojave.

Plans for the X Prize Cup starting in October 2005; America's Space Prize, a $50 million prize for the creation of an orbital spacecraft; and plans of developers such as Rocketplane Ltd. and Virgin Galactic to begin passenger-carrying flights between 2007 and 2008[1,2] are persuading states to establish commercial launch sites in the near term. Construction and operation of a launch site, related facilities, and infrastructure offer opportunities to drive economic development and jobs to a particular region. For example, a study of NASA's Kennedy Space Center in Florida showed that KSC contributed $3.1 billion in total economic activity, $1.5 billion in household earnings, and 35,000 jobs for the state of Florida in FY2003, even with the three space shuttles grounded that year following the Columbia disaster.[3]

Florida Space Authority recently announced that it would spend $130,000 to conduct a feasibility study on creating a private spaceport.[4] The study would assess the feasibility of developing a responsive range within the Cape Canaveral Spaceport, forecast the potential launch market for the new spaceport, and quantify the economic benefit that the state would derive from the facility.

After New Mexico was chosen to host the X Prize Cup events in 2005, Governor Bill Richardson said in a press release on April 13, 2005, "This year's Countdown to X PRIZE CUP is the important first step in creating an event that will not only assist in opening the space frontier to all private citizens, but will bring new companies, provide new jobs, increase tourism statewide, and help brand New Mexico as the place to be to experience the future."[5]

Leaders in other states such as Alaska, Oklahoma, Texas, and Wisconsin also recognize the value of hosting launch sites and are investing state and private funds to develop these assets in preparation for the future market. About $100 million in state and federal funds has been invested in the Kodiak Launch Complex in Alaska. In some cases these spaceports are growing from existing orbital space launch facilities, others are adaptations of aviation facilities, and some facilities are emerging out of the American grasslands, requiring varying levels of investment and infrastructure. This FAA/AST special report provides information about the infrastructure available at U.S. non-federal spaceports, total investment in U.S. non-federal spaceports to date and their annual operations budgets. The report highlights the importance that states place on launch activity as it relates to their economic and industrial planning.

Methodology

For this discussion three types of non-federal spaceports have been identified. The licensed spaceports currently have FAA launch site licenses. The spaceports in this category are Kodiak Launch Complex (KLC) in Alaska; the California Spaceport on Vandenberg Air Force Base (VAFB), California; Launch Complex 46 on Cape Canaveral Air Force Station (CCAFS), Florida; Mojave Airport Civilian Flight Test Center, Mojave, California; and Mid-Atlantic Regional Spaceport (MARS) at Wallops Island, Virginia. The developing spaceports are up-and-coming facilities that are operating in some capacity but do not currently have an FAA launch site operator license. States with spaceports in this category include New Mexico, Oklahoma, Wisconsin, and Texas. Proposed spaceports are somewhat active but lack significant infrastructure. States with spaceports in this category include Alabama, Montana, and additional sites in Texas.

Data for this report was collected from public sources and personal interviews of spaceport operators. Information on available infrastructure was obtained from publicly available documents. A specific emphasis was placed on identifying resources that were jointly used by the existing federal and non-federal spaceports.

Respondents were asked three questions designed to ascertain the amount of investment made to date, sources of revenue, and the annual budget of their operations. Specifically the questions asked were:

- What is the estimated total value of the existing spaceport facilities or development activities if the spaceport is not established?

- How much government and private investment has gone into the spaceport to date?

- What is the total annual operations budget for the spaceport in your state?

Table 1 - Non-Federal Spaceport Infrastructure

Spaceport	FAA Status	Infrastructure	Joint Use Assets
Established			
Alaska - Kodiak Launch Complex	FAA-Licensed (ELV operations)	Launch control center, payload processing facility, integration and processing facility, tracking and telemetry.	None
California Spaceport	FAA-Licensed (ELV operations)	Launch pads, runways, payload processing facilities, range assets.	Range assets of the USAF Western Test Range, runways of Vandenberg AFB.
Florida Space Authority Spaceport	FAA-Licensed (ELV operations)	One launch complex with a launch pad and remote control center, a small payload preparation facility, and an RLV support facility.	Range assets of the USAF Eastern Test Range.
Mid-Atlantic Regional Spaceport	FAA-Licensed (ELV operations)	Two launch pads, payload and vehicle processing buildings, payload recovery capability.	Range and airport assets of the Wallops Flight Facility.
Mojave Airport	FAA-Licensed (RLV operations)	Air control tower, runway, rotor test stand, engineering facilities, high bay building.	None
Developing			
New Mexico	Pre-Application Consultation	None. White Sands Missile Range (WSMR) hosts the spaceport's activities currently.	WSMR launch facilities
Oklahoma	Pre-Application Consultation	Runway, maintenance and painting hanger, and 12.4 square kilometers of land for further construction.	None
Wisconsin	Not licensed	Suborbital vehicle launch pad and portable mission control facilities.	None
Texas-Gulf Coast Regional Spaceport	Pre-Application Consultation	None	None
Conceptual			
Alabama	Not licensed	None	None
Texas-South Texas Spaceport	Not licensed	None	None
Texas-West Texas Spaceport	Not licensed	None	None

Non-Federal Spaceport Infrastructure and Investment

The non-federal spaceports currently display a wide variety of capabilities, from well-established launching points to conceptual studies. Many of the more developed spaceports have the advantage of being co-located with existing federal launch ranges, allowing them to enter into agreements for the use of existing assets or important supplemental services and avoid costly and lengthy construction projects. Other spaceports are growing out of existing airports, especially those with good access to the restricted airspace necessary for suborbital or orbital launches. The remaining spaceports have humble beginnings as open fields or unoccupied land, frequently with existing transportation and utility connections. Table 1, on page SR-3, describes spaceport infrastructure in more detail.

To date about $165 million has been invested into non-federal spaceports across the nation. The activity is primarily funded by the individual states with private sponsorship and some federal government support. In the established spaceport category, with the exception of Mojave Airport, federal agencies such as the Department of Defense and NASA have served as the primary customer of spaceport services. An average of $2.8 million is spent yearly operating the established, licensed spaceports and $270,000 towards the progression of each developing and conceptual spaceport.

Licensed Spaceports

Alaska

The Kodiak Launch Complex at Narrow Cape, on Alaska's Kodiak Island, became the first launch site not to be co-located with a federal facility upon completion of construction in 2000. The launch complex—a 12.4 square-kilometer (4.8 square-mile) site more than 400 kilometers (250 miles) south of Anchorage—includes a launch control center, a payload processing facility, an integration and processing facility, a spacecraft assembly facility, a range safety and telemetry system, and two launch pads; one with a support structure.[6] The complex is capable of conducting orbital or suborbital launches in all weather conditions, and can be used to place satellites into LEO, polar, or Molniya orbits.

The Kodiak Launch Complex has hosted eight launches to date including seven suborbital and one orbital launch. Customers comprise various U.S. government agencies like the Missile Defense Agency, NASA, the U.S. Army, and the U.S. Air Force. The spaceport has signed several contracts for future launches, including a five-year contract signed in 2003 to conduct launch support services for multiple tests of the nation's missile defense system.

The Alaska Aerospace Development Corporation (AADC) estimates that about $100 million has been invested in the creation of the Kodiak Launch Complex since the Alaska State Legislature created the organization in 1991.[7] The State of Alaska has contributed slightly more than $10 million and the federal government approximately $90 million over the lifetime of the facility. The annual operations budget is about $5.5 million a year.[8]

California

The California Spaceport is co-located with Vandenberg Air Force Base on the coast of California. The managing operators of the spaceport, Spaceport Systems International (SSI), signed a 25-year lease for the land that holds the spaceport in 1995, and completed basic construction in 1999. After additional construction in 2004, the spaceport now offers facilities to process payloads and launch solid propellant rockets to low-polar-orbit inclinations, with possible azimuths ranging from 220 to 165 degrees. The facilities include a pad deck, support equipment building, launch equipment vault, launch duct, launch stand, access tower, communications equipment, range support interfaces, a rolling access gantry, and an Integrated Processing Facility (IPF).

The IPF—originally built to service three Space Shuttle payloads simultaneously—has been used to service several NASA satellites. Additionally, SSI won a 10-year satellite-processing contract from the U.S. Air Force in 2002, and signed a similar contract to provide service to the National Reconnaissance Office until 2011. The spaceport has launched two Minotaur rockets carrying payloads to polar orbit, and could have three more Minotaur launches during 2005.

While exact funding numbers could not be obtained for this report, SSI, a division of ITT Industries has made significant private investment in the California Spaceport. In May of 1999, SSI completed the construction of the commercial launch pad at the spaceport.[9] The federal government served as a catalyst for the commercial spaceport's construction. In 1996 the USAF's Space and Missile Test and Evaluation Directorate awarded a $6-million contract to SSI for launch services for the Launch Test Program.[10] Altogether, about $7 million in federal and state grants have been awarded to SSI.[11] In 2000, $180,000 was received to upgrade the IPF east breach load doors in the IPF transfer tower. In 2001, SSI received approximately $167,000 to upgrade the satellite command and telemetry systems.[12]

Florida

The Spaceport operated by the Florida Space Authority (FSA), co-located with the Cape Canaveral Air Force Station, allows the Authority to take advantage of underused facilities at CCAFS, improving and operating them on a dual-use, non-interference basis with USAF programs. The FSA has primarily focused on modifying and refurbishing CCAFS Launch Complex 46 (LC-46), fitting it to accommodate small commercial launch vehicles in addition to the U.S. Navy's Trident missiles. LC-46 is capable of supporting the launch of payloads in excess of 1,800 kilograms (4,000 pounds) to LEO via a variety of commercial launch systems.

In addition to LC-46, FSA has obtained a license from the Air Force to use Launch Complex 47.[13] It also assisted in the financing of Complexes 37 and 41 to accommodate the Titan 4 and the Delta 4 respectively.[14] The existing launch complexes are complemented by an RLV support complex and a space operations support complex.

Groundbreaking on a large International Space Research Park is expected to occur in 2005. The spaceport has conducted two orbital launches since January 1998, and continues to seek new customers.

A total of $49.5 million has been spent on commercial space activities at CCAFS. The State of Florida annually funds operations through the Florida Space Authority at a level of $1.5 million. Other projects account for about $2 million for a total annual operations budget of $3.5 million.[15] FSA recently announced that it would spend $130,000 to study the feasibility of adding a private spaceport.

Spaceport Florida is also attracting non-infrastructure related investment. On October 27, 2004, a local higher education institution, Brevard Community College, received a $98,560 grant from the U.S. Department of Labor for the purposes of providing hands-on learning opportunities for students to develop technical aerospace skills and improve awareness of skills required for aerospace careers.[16] Selected student groups will use some of this money to conduct six suborbital launches from Launch Complex 47.

Mid-Atlantic Regional Spaceport

The Mid-Atlantic Regional Spaceport (MARS) is co-located with the NASA Wallops Flight Facility. The spaceport consists of two launch pads on Wallops Island. The first pad, Launch Pad 0-B, allows launches of small and medium ELVs with gross liftoff weights of up to 225,000 kilograms (496,000 pounds) to LEO. The second pad acquired by MARS, Pad 0-A—currently being refurbished—will support smaller ELVs, with gross liftoff weights of less than 90,000 kilograms (198,000 pounds), allowing customers to place a 1,350-kilogram (3,000-pound) satellite into LEO. The site is optimal for launches to place spacecraft into orbits with inclinations ranging from 38 to 60 degrees, though launches into other orbits are possible with in-flight maneuvers. In addition to the two pads, the facility boasts a mobile service structure, and MARS is currently constructing a logistics and processing facility.

Development and funding of MARS (previously the Virginia Space Flight Center) has primarily been supported by the State of Virginia and the federal government. As of fiscal year 2004, Virginia has funded $2.5 million and the U.S. government has funded $2.4 million. The State of Maryland began contributing to the spaceport in the amount of $150,000 in July of 2004. About $100,000 in private investment has also been provided to MARS.[17]

Mojave Airport

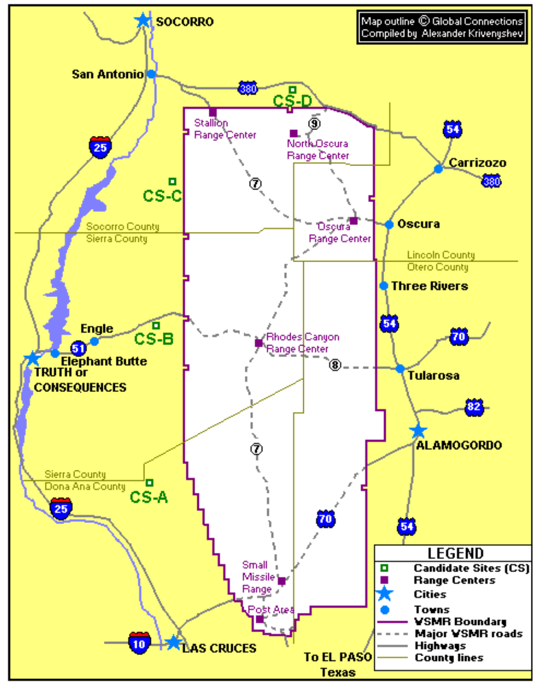
In 2004, the East Kern Airport District, where Mojave Airport is located, made a significant investment of resources and personnel to receive its launch site license from the FAA. The license permits suborbital launch activities at the airport, and has helped Mojave market its capabilities as the nation’s first inland launch site. Mojave began its site application in January 2003 and received its FAA license on June 17, 2004.

Mojave Airport, which consists of three runways measuring up to 2,894 meters (7,050 feet), was the site of all three suborbital launches of SpaceShipOne, the craft that won the Ansari X Prize. XCOR Aerospace, another company hoping to offer suborbital space tourism, has also performed tests of their EZ Rocket vehicle craft from Mojave.

In addition to the runways, Mojave Airport offers hangars, maintenance shops, fuel service facilities, and the offices of several aerospace companies. Although Mojave can claim the title of spaceport, its space operations are very similar to its aviation operations. Both Scaled Composites and XCOR Aerospace are based at Mojave and will use horizontal takeoffs. This precludes the need for a lot of specialized facilities as found at vertical takeoff spaceports. The spaceflight-specific facilities that are there, like the rotor test stand used during the defunct Rotary Rocket tests, engine test stands built by HMX, Inc. for the DARPA RASCAL program, and rocket engine test stands of XCOR Aerospace, were all constructed by private companies.[18,19] In addition, before it became a spaceport, the airport supported manned and unmanned aerial vehicle testing with the tracking equipment located there. Therefore Mojave Airport represents the unique example of space operations sprouting from a location that was fertilized for its growth without directed government influence.

Developing Spaceports

New Mexico



The Southwest Regional Spaceport (SRS) was selected as the future home of the X Prize Cup, an annual exhibition intended as a follow-on to the successful Ansari X Prize. The spaceport is currently being developed, with a proposed 70 square-kilometer (27 square-mile) site in Upham, New Mexico.[20] The spaceport is being designed to support all classes of RLVs launching to suborbital trajectories as well as equatorial, polar, and ISS-servicing orbits, and will include facilities for payload integration, launch, and landing. The spaceport will also share resources and integrate launch scheduling with the U.S. Army test range at White Sands (WSMR). The spaceport plans to begin operations in 2007 or 2008.

New Mexico retains control of most of the spaceport resources. In 2005, the New Mexico state legislature created the New Mexico Spaceport Authority to oversee the construction and operation of the spaceport. To date $750,000 has been spent on getting the spaceport concept started. Fiscal year 2004 saw $9 million committed to the construction of a runway with the expectation of federal matching funds of about $89 million.

In fiscal year 2005 the governor authorized $1 million for capital outlay expenditures. To facilitate the X Prize Cup, the State of New Mexico is expected to authorize an additional $5 million that will be used partially to fund infrastructure for the Cup.[21]

Oklahoma

The state of Oklahoma is developing a spaceport at Clinton-Sherman Industrial Airpark in Burns Flat, Oklahoma. The spaceport will be able to host horizontally-launched RLVs from its 4,115-meter (13,500-foot) runway. Additionally, the site includes a manufacturing facility, maintenance hangar, and 12.4 square kilometers of undeveloped land available for use.[22]

The site is currently undergoing an environmental impact study, and may be operational as early as late 2005. Rocketplane Ltd. expects to begin suborbital space operations there in 2007.[23]

Since the inception of the Oklahoma Space Industry Development Authority (OSIDA) in 2000, the state of Oklahoma has invested $2.4 million into spaceport development. The activity is wholly state supported, though the city of Clinton will be giving title of the former Clinton-Sherman Air Force base property, which is valued at $1 billion, to the state.[24] OSIDA operates with an annual budget of $650,000.

Wisconsin

The Wisconsin Spaceport is currently operating in the city of Sheboygan, serving suborbital launches reaching up to 55 kilometers (34 miles). At present, the spaceport consists of a vertical launch pad and portable launch facilities. It currently exists primarily as an educational facility, partnering with Rockets for Schools to conduct launches for students from Wisconsin and surrounding states. The spaceport has also cooperated with the Florida Space Authority, which has helped support some of the site's larger launches. The Wisconsin Spaceport continues to host launches and other programs for educational purposes and eventually plans to enter the space tourism market.

The site currently operates on a total investment of $20,000.[25] Private contributions provide funding for larger scale rockets and suborbital launch activities. Project supporters plan to acquire a FAA launch site license.

Texas - Gulf Coast Regional Spaceport

The Gulf Coast Regional Spaceport in Brazoria County is a proposed site intended to begin hosting suborbital launches as early as 2005. A plot of undeveloped land 80 kilometers (50 miles) south of Houston has been identified as a host site, and the Spaceport Development Corporation is attempting to acquire or lease the property.[26]

The Gulf Coast Regional Spaceport effort is primarily funded by the local and state governments. About $2 million has been spent so far to develop the spaceport. Annual costs to operate, develop and promote the spaceport are about $400,000.[27]

Proposed Spaceports

Alabama

Spaceport Alabama is a proposed spaceport that could be formally adopted by the state at the end of 2006. As currently proposed, the spaceport would support next-generation RLVs launching to LEO, MEO, and GEO, and could be operational by 2010. A site near the city of Mobile is under consideration for the spaceport, which may also be used to support suborbital ELVs.

The state of Alabama has invested $2 million in its spaceport to sponsor development studies. This funding is comprised of 75% state government investment and 25% private investment.[28] About $500,000 a year is spent to lay the groundwork for Spaceport Alabama. The Aerospace Development Center (ADC) of Alabama has, as one of its responsibilities, the mission to develop the strategic plan to establish Alabama's spaceport infrastructure.[29] The ADC recently changed from a state-sponsored organization to a 501(c)3 non-profit organization. It will continue to shepherd the development of Spaceport Alabama until a suitable state-sponsored organization is found.[30]

Texas - South Texas Spaceport

The South Texas Spaceport is a proposed spaceport to be placed on a 40 square-kilometer plot of land in Willacy County, adjacent to the Gulf of Mexico. As currently proposed the site will consist of two launch pads and a support building, and will be able to service suborbital and small-lift orbital systems.

The site has already hosted the launch of a small suborbital sounding rocket, conducted primarily for promotional purposes. The spaceport is currently seeking state grants and searching for long-term RLV customers.

Over the past five years approximately $2 million has been spent on developing a spaceport in Willacy County, Texas.[31] The State of Texas awarded a $500,000 grant to the spaceport. After budget cuts the grant was reduced to $450,000. The spaceport has been operating on this money for the past couple of years. They expect $175,000 to be released from state coffers shortly.[32] This money will be used to build infrastructure at the Willacy County site. The planned structures include a road, sewage and water lines, and a building that will be available for leasing. If funds remain, a bunker will be constructed. A local economic development corporation has been championing the cause for the spaceport, but the majority of funding has come from the State of Texas.

Texas - West Texas Spaceport

The West Texas Spaceport is a proposed site in Pecos County intended to include a launch site, an adjacent recovery zone, and payload and integration facilities. The site will also take advantage of locally available optical tracking equipment capable of recording flights up to tens of thousands of feet. The site is expected to host both educational and technology demonstration suborbital launches.

This spaceport has primarily been supported by private organizations. The Texas Aerospace Commission has contributed $500,000 to the site and the Fort Stockton Economic Development Corporation contributed $170,000. The City of Fort Stockton and the local government have put $320,000 towards the venture. The Texas governor's office has invested $175,000 in the Pecos County, Texas, site. The spaceport also generates $100,000 in revenues from commercial range fees from suborbital rocket launches and UAV flights. The U.S. Department of Agriculture awarded a Rural Business Opportunity Grant that was used to produce a community development plan based on the impact of the Aerospace Development Center. The total amount invested in spaceport activities is estimated at $1,195,000. The annual operation budget is $364,000.[33]

Conclusion

The promise of new markets, including suborbital space tourism, is driving a renewed interest in the states for hosting commercial launch sites. Not only do spaceports bring aerospace industry and jobs to a community, but they also aid in developing service industries, tourism, and transportation hubs. While spaceport infrastructure and operations require significant public and private investment, state and local leaders see the value in potential commercial markets that include the possibility of revenues exceeding $1 billion per year by 2021, according to Futron Corporation's *Space Tourism Market Study*.[34]

Many of the non-federal spaceports were initially proposed in an attempt to win a lucrative contract for VentureStar, a proposed full-scale version of the X-33 launch vehicle that was meant to be the nation's next-generation space shuttle. When the VentureStar program was cancelled in 2001, the proposed spaceports were forced to re-evaluate their plans, and many proposals were cancelled. However, those that have persevered now find themselves chasing new markets, particularly suborbital space tourism.

Several of the spaceports are now actively seeking agreements and business relationships with former competitors for the Ansari X Prize and other promising new entrants into the launch market. New Mexico has won the rights to host the annual X Prize Cup events, while Mojave Airport is home to Scaled Composites and XCOR Aerospace, and Oklahoma developed tax incentives that attracted both Rocketplane Ltd. and TGV Rockets.

In many cases, existing spaceport assets and investments are being leveraged to attract additional tenants, businesses, and services to the launch sites, which are likely to generate jobs and spending in their communities.

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First Quarter 2005 Orbital and Suborbital Launch Events

Date			Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price	L	M
1/12/2005			Delta 2 7925H	CCAFS		Deep Impact	Jet Propulsion Laboratory (JPL)	Scientific	$45-55M	S	S
1/20/2005			Kosmos 3M	Plesetsk		Kosmos 2414	Russian Ministry of Defense (MoD)	Navigation	$12M	S	S
						Tatiana	Lomonosov Moscow State University	Development		S	S
2/2/2005	√		Proton M	Baikonur	*	AMC 12	SES Americom	Communications	$70M	S	S
2/3/2005			Atlas 3B	CCAFS		NOSS 3 F3	U.S. Air Force	Classified	$65-75M	S	S
2/12/2005	√		Ariane 5 ECA	Kourou		XTAR EUR	XTAR	Communications	$125-155M	S	S
						MaqSat B2	Arianespace	Test		S	S
						SloshSat-FLEVO	European Space Agency (ESA)	Development		S	S
2/26/2005			H 2A 2022	Tanegashima		MTSat 1R	Japan Aerospace Exploration Agency (JAXA)	Navigation	$70-100M	S	S
2/28/2005			Soyuz	Baikonur		Progress ISS 17P	Russian Federal Space Agency (Roscosmos)	ISS	$30-50M	S	S
						Teknologiya-42	Space Research Institute	Development		S	S
2/28/2005	√	+	Zenit 3SL	Odyssey Launch Platform	*	XM 3	XM Satellite Radio, Inc.	Communications	$70M	S	S
3/11/2005	√	+	Atlas 5 431	CCAFS	*	Inmarsat-4 F1	Inmarsat	Communications	$70M	S	S
3/29/2005			Proton K	Baikonur	*	Express AM2	Russian Satellite Communciation Co.	Communications	$60-85M	S	S

√ Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed.
\+ Denotes FAA-licensed launch.
* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity.

Notes: All prices are estimates, and vary for every commercial launch. Government mission prices may be higher than commercial prices.

Ariane 5 payloads are usually multi-manifested, but the pairing of satellites scheduled for each launch is sometimes undisclosed for proprietary reasons until shortly before the launch date.

Second Quarter 2005 Projected Orbital and Suborbital Launch Events

Date	Vehicle	Site	Payload or Mission	Operator	Use	Vehicle Price
4/11/2005	Minotaur	VAFB	XSS-11	U.S. Air Force (USAF)	Development	$12-17M
4/12/2005	Long March 3B	Xichang	* APStar 6	APT Satellite Co., Ltd.	Communications	$50-70M
4/15/2005	Soyuz	Baikonur	Soyuz ISS 10S	Roscosmos	ISS	$30-50M
4/15/2005	Pegasus XL	VAFB	DART	NASA	Development	$14-18M
4/26/2005 √	+ Zenit 3SL	Odyssey Launch Platform	* Spaceway 1	Hughes Network Systems	Communications	$70M
4/29/2005	Titan 4B	CCAFS	NRO T1	National Reconnaissance Office (NRO)	Classified	$350-$450M
5/5/2005	PSLV	Satish Dhawan Space Center	Cartosat 1	Indian Space Research Organization (ISRO)	Remote Sensing	$15-25M
			VUSat	Amsat India	Development	$15-25M
5/11/2005	Delta 2 7320	VAFB	NOAA N	National Oceanic and Atmospheric Administration (NOAA)	Meteorological	$45-55M
5/21/2005 √	Proton M	Baikonur	* DirecTV 8	DirecTV, Inc.	Communications	$70M
5/31/2005 √	Volna	Barents Sea	Cosmos 1	The Planetary Society	Development	$0.8-1.5M
5/31/2005	Soyuz	Plesetsk	Foton M2	ESA	Scientific	$30-50M
5/2005	Delta 2 7925-10	CCAFS	Navstar GPS 2RM-1	USAF	Navigation	$45-55M
6/10/2005	Soyuz	Baikonur	Progress ISS 18P	Roscosmos	ISS	$30-50M
6/23/2005 √	+ Delta 4 Medium	CCAFS	GOES N	NOAA	Meteorological	$70M
6/24/2005	Proton K	Baikonur	* Express AM3	Russian Satellite Communciation Co.	Communications	$65-85M
6/30/2005	Rockot	Baikonur	Monitor E1	Roscosmos	Remote Sensing	$12-15M
6/2005 √	+ Zenit 3SL	Odyssey Launch Platform	* Intelsat Americas 8	Intelsat	Communications	$70M
6/2005 √	Ariane 5 ECA	Kourou	* Spaceway 2	Hughes Network Systems	Communications	$125-155M
			* Telkom 2	PT Telkomunikasi	Communications	

√ Denotes commercial launch, defined as a launch that is internationally competed or FAA-licensed.

\+ Denotes FAA-licensed launch.

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Third Quarter 2005 Projected Orbital and Suborbital Launch Events

Date	Vehicle	Site	Payload or Mission	Operator	Use	Vehicle Price
7/10/05	Titan 4B	VAFB	NRO T5	NRO	Classified	$350-450M
7/10/05 √	Soyuz	Baikonur	* Galaxy 14	PanAmSat Corp.	Communications	$70M
7/22/05	Delta 2 7420	VAFB	Calipso	NASA	Scientific	$45-55M
			CloudSat	NASA	Scientific	
7/2005	Shuttle Discovery	Kennedy Space Center	STS 114	NASA	ISS	N/A
			ISS LF-1	NASA	ISS	
7/2005	Delta 2 7925-10	CCAFS	Navstar GPS 2RM-2	USAF	Navigation	$45-55M
7/2005	Ariane 5G	Kourou	Syracuse 3 A	Delegation Generale pour l'Armement (DGA)	Communications	$125-155M
			* Galaxy 15	PanAmSat Corp.	Communications	
7/2005	Minotaur	VAFB	STP R1	U.S. Air Force	Development	$12-17M
7/2005	Proton K	Baikonur	* Yamal 203	Gazkom Joint Stock	Communications	$65-85M
			* Yamal 204	Gazkom Joint Stock	Communications	
8/10/05	+ Atlas 5 401	CCAFS	Mars Reconnaissance Orbiter	JPL	Scientific	$65-85M
8/23/05	Ariane 5 ECA	Kourou	MSG 2	Eumetsat	Meteorological	$125-155M
			* Insat 4A	Indian Space Research Organization (ISRO)	Communications	
8/24/05	Soyuz	Baikonur	Progress ISS 19P	Federal Space Agency	ISS	$30-50M
8/30/05	Delta 4 Medium-Plus	VAFB	NRO L-22	Department of Defense (DoD)	Classified	$70-85M
8/2005 √	Proton M	Baikonur	* Measat 3	Binariang Satellite Systems Sdn Bhd	Communications	$70M
8/2005	Dnepr 1	Baikonur	OICETS	Japan Aerospace Exploration Agency (JAXA)	Scientific	$8-11M
8/2005 √	Kosmos	Plesetsk	Topsat	British Defense Ministry	Development	$12M
			* Mesbah	Telecommunications Company of Iran	Communications	
			Ncube-2	Norwegian Student Satellite Project	Development	
			China DMC+4	Beijing Landview Mapping Information Technology Ltd	Remote Sensing	
			Mozhayets 5	Mozhaiskiy Military Space Engineering Academy	Development	
			UWE-1	University of Wurzburg	Scientific	
			Sinah-1	Iran	Classified	
			XI-V	University of Tokyo ISSL	Development	
8/2005 √	Proton M	Baikonur	* Anik F1R	Telesat Canada	Communications	$70M
8/2005	M 5	Uchinoura	Astro-E2	JAXA	Scientific	$50-60M
8/2005	Zenit 2	Baikonur	Resurs 01-N5	Roscosmos	Remote Sensing	$30-45M
9/15/05 √	Rockot	Plesetsk	Cryosat	ESA	Remote Sensing	$12-15M
9/27/05	Soyuz	Baikonur	Soyuz ISS 11S	Roscosmos	ISS	$30-50M
9/30/05	Delta 2 7920	VAFB	NRO L-21	NRO	Classified	$45-55M
9/2005 √	Zenit 3SL	Odyssey Launch Platform	* Inmarsat-4 F2	Inmarsat	Communications	$70M
3Q/2005	Pegasus XL	CCAFS	TWINS A	NASA	Scientific	$14-18M
3Q/2005	H 2A 202	Tanegashima	ALOS 1	JAXA	Remote Sensing	$70-100M
3Q/2005 √	+ Pegasus XL	Kwajalein Island	C/NOFS	USAF	Scientific	$14-18M
3Q/2005	Falcon 1	VAFB	TacSat 1	USAF	Development	$6M
			* Celestis 5	Celestis, Inc.	Other	
3Q/2005	Shuttle Discovery	Kennedy Space Center	STS 121	NASA	Scientific	N/A
			ISS ULF-1.1	NASA	ISS	

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